TM 8-612

WAR DEPARTMENT TECHNICAL MANUAL

DISTILLING APPARATUS

WAR DEPARTMENT • JULY 1945

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This manual supersedes TM 8-612, 17 July 1944.

DISTILLING APPARATUS

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United States Government Printing Office
Washington: 1945

WAR DEPARTMENT

Washington 25, D. C., 13 July 1945

TM 8–612, Distilling Apparatus, is published for the information and guidance of all concerned.

[AG 300.7 (31 May 45)]

BY ORDER OF THE SECRETARY OF WAR:

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Refer to FM 21–6 for explanation of distribution formula.

CONTENTS

This manual supersedes TM 8-612, 17 July 1944.

PART ONE

INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the information and guidance of the personnel to whom this equipment is assigned. They contain information on the operation and maintenance of the equipment as well as descriptions of the major units and their functions in relation to the other components of the equipment. They apply to the following Medical Department items:

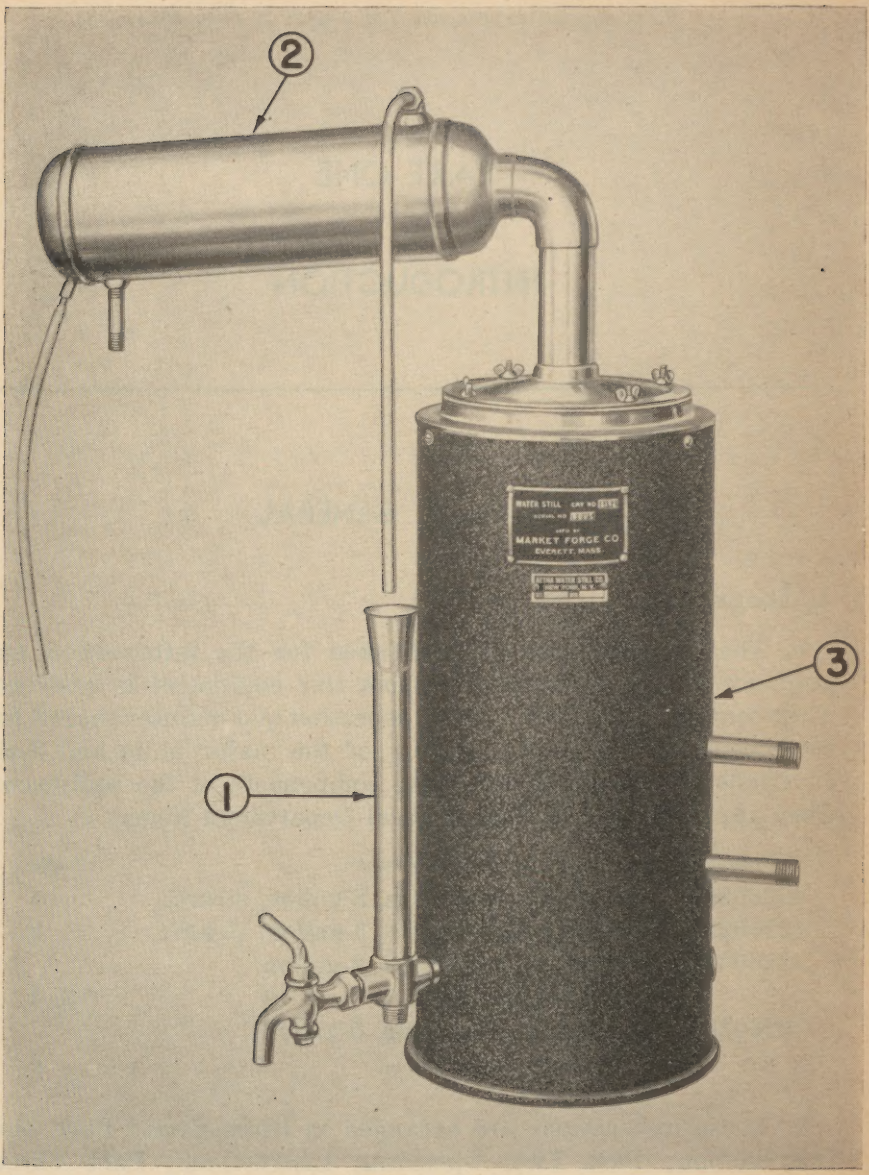
Med. Dept. No.	*Nomenclature*	*Figure*
4226020	Distilling apparatus, 2-gallon, steam:	1
4226022	Distilling apparatus, 5-gallon, steam:	2
4226035	Distilling apparatus, 2-gallon, leaded gasoline:	3, 4
4226038	Distilling apparatus, 5-gallon, leaded gasoline:	5

b. These instructions are arranged in three parts: Part One, Introduction; Part Two, Operating Instructions; Part Three, Maintenance Instructions.

c. All requisitions for spare parts should be submitted in accordance with the latest revision of ASF Supply Catalog MED 7.

2. Records

No records are required to be kept on this apparatus except as may be designated by the Medical Officer in charge.



1. Water level column for steam model.
2. Condenser for steam model.
3. Boiler for steam model.

Figure 1. Distilling apparatus, 2-gallon, steam; manufactured by Market Forge Co.

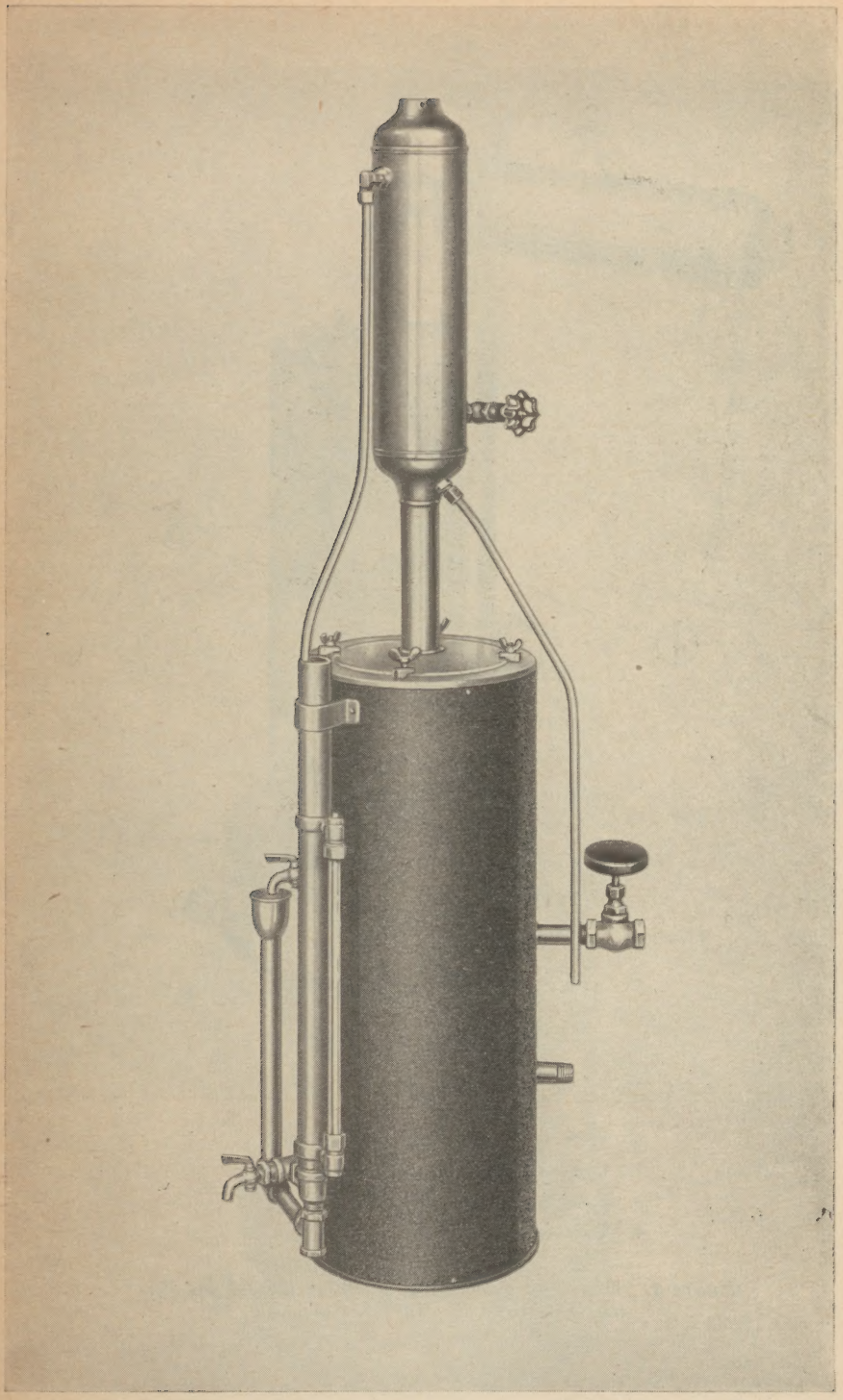
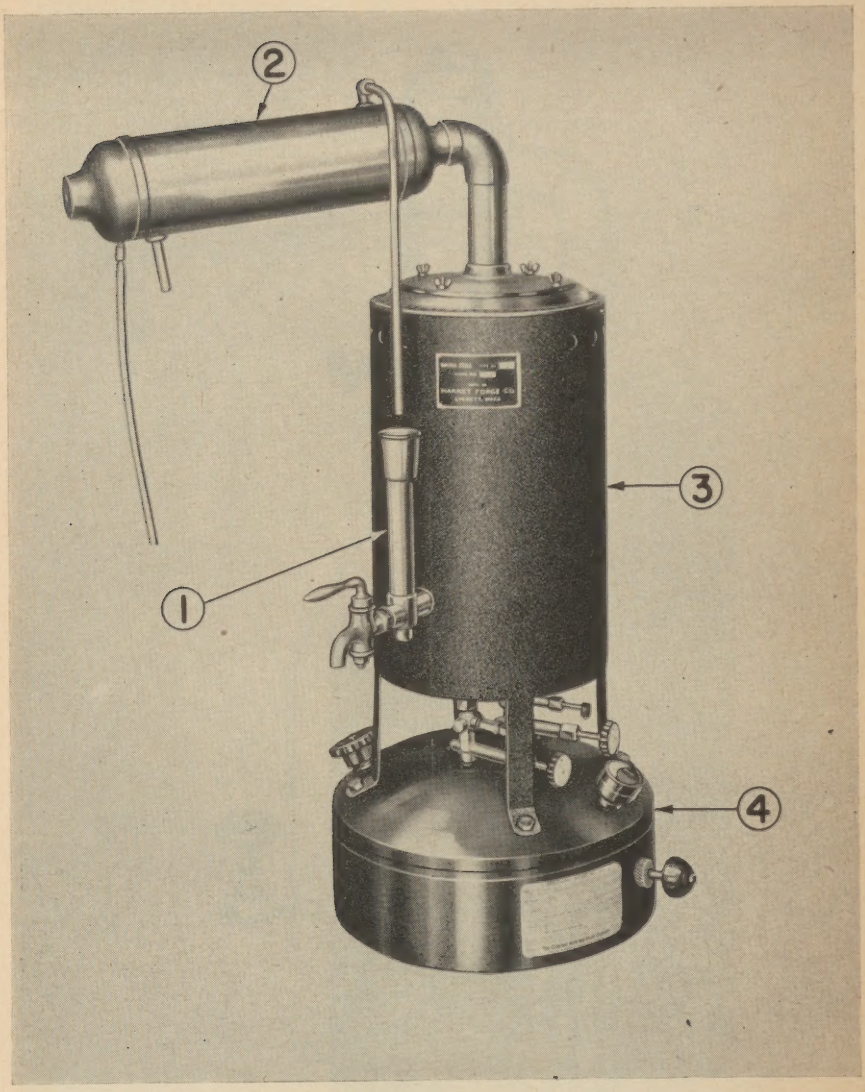
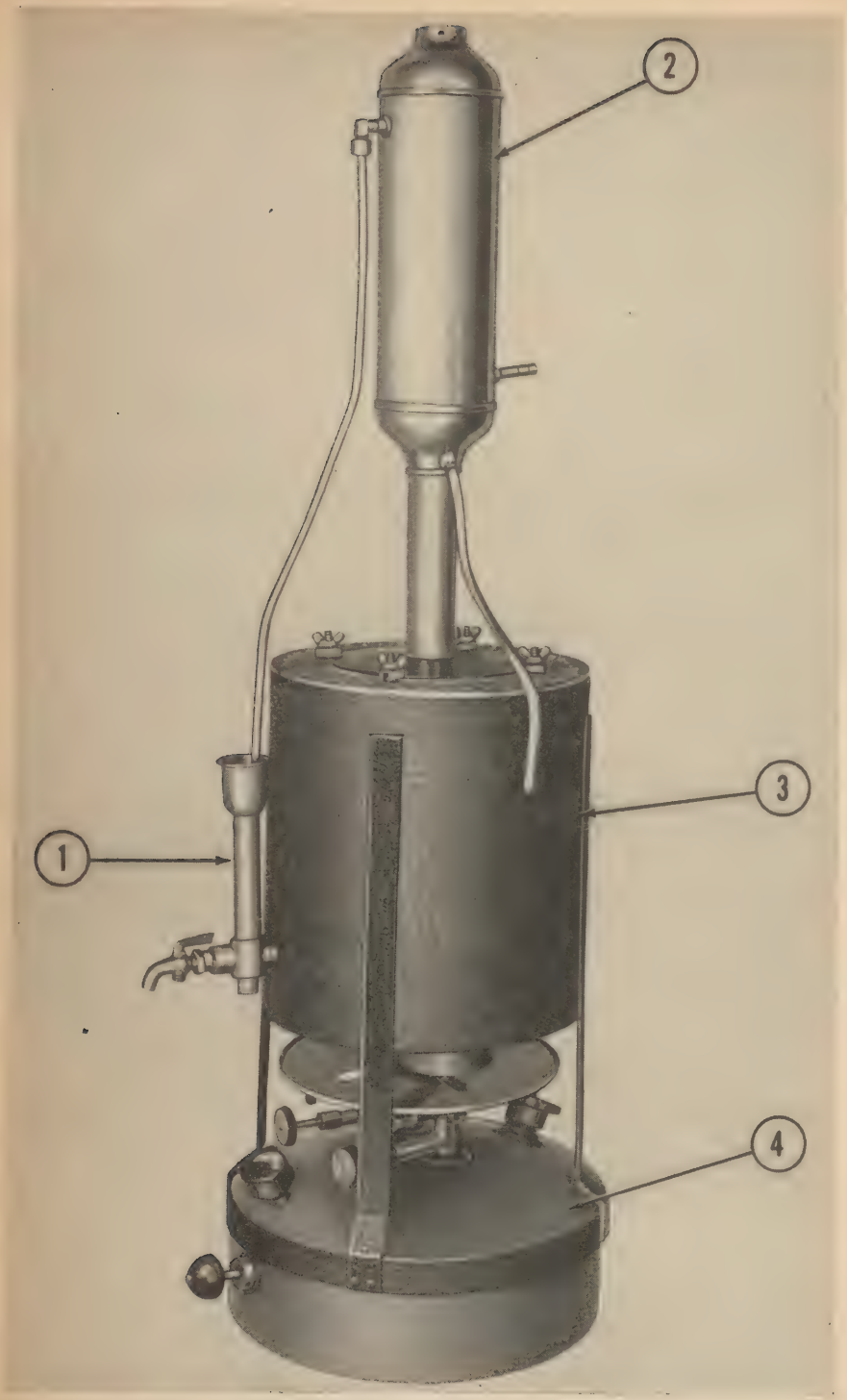


Figure 2. Distilling apparatus, 5-gallon, steam; manufactured by Consolidated Machine Works, Inc.



1. Water level column gasoline model.
2. Condenser assembly for gasoline model.
3. Boiler for gasoline model.
4. Gasoline burner.

Figure 3. Distilling apparatus, 2-gallon, leaded gasoline; manufactured by Market Forge Co.



1. Water level column.
2. Condenser assembly for gasoline model.
3. Boiler for gasoline model.
4. Gasoline burner.

Figure 4. Distilling apparatus, 2-gallon, leaded gasoline; manufactured by Consolidated Machine Works, Inc.

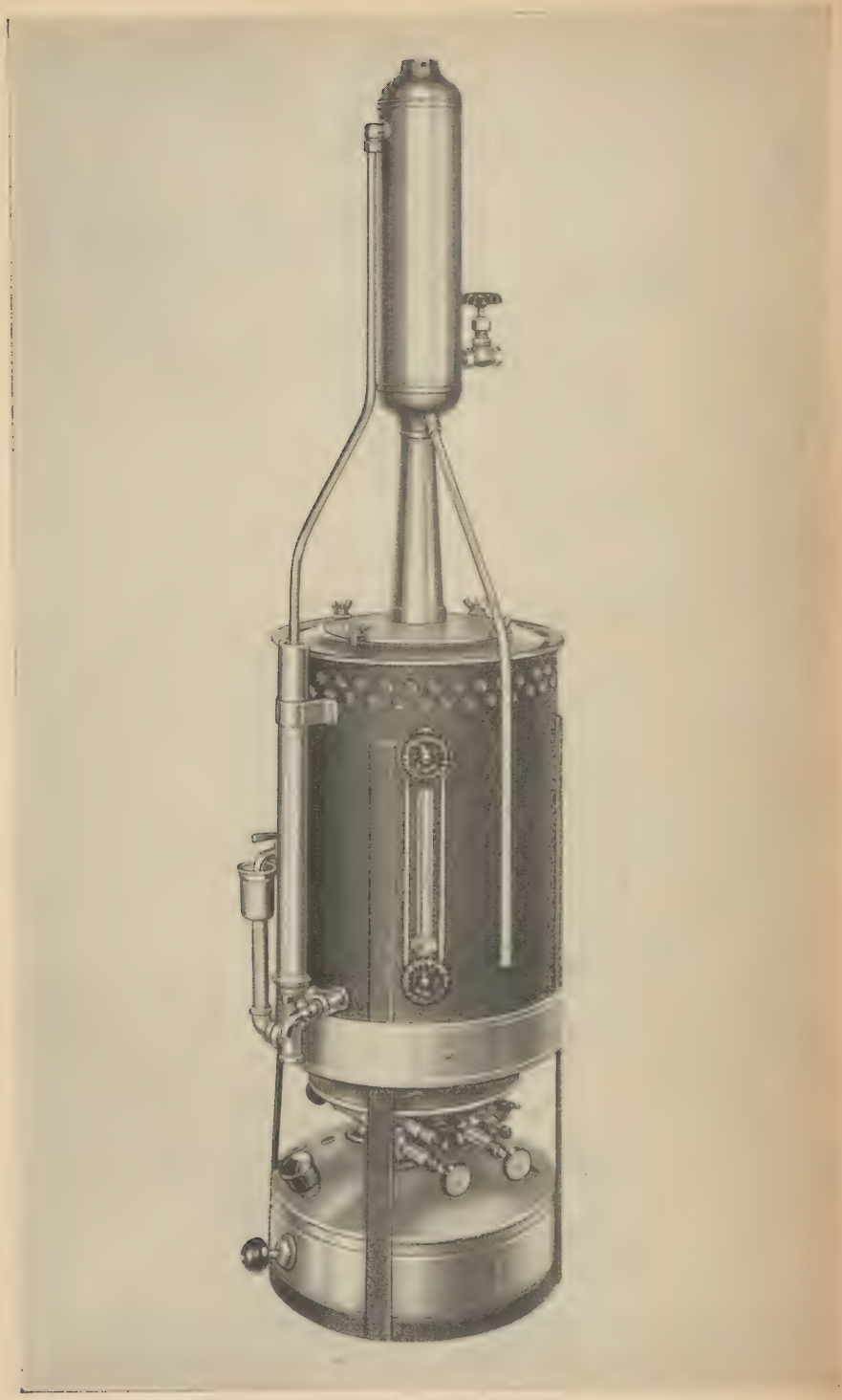


Figure 5. Distilling apparatus, 5-gallon, leaded gasoline; manufactured by Consolidated Machine Works, Inc.

Section II. DESCRIPTION AND TABULATED DATA

3. Description

The distilling apparatuses are standard type water stills used for the production of distilled water. They are issued in two models: gasoline-heated and steam-heated models. This manual covers the two gallon and five gallon sizes of both models.

4. Tabulated Data

See chart I.

5. Manufacturers

a. Market Forge Co., (Aetna Water Still Co.) Everett, Mass.
Model KL–2A, Gasoline heated, Item No. 4226035.
Model SL–2, Steam heated, Item No. 4226020.

b. Consolidated Machine Works, Inc.
Model GLV–2, Gasoline heated, Item No. 4226035.
Model GLV–5, Gasoline heated, Item No. 4226038.
Model SLV–5, Steam heated, Item No. 4226022.

Chart I.

	2-gallon steam heated	2-gallon gasoline heated	5-gallon steam heated	5-gallon gasoline heated
Production per hour	2 gallons	2 gallons	5 gallons	5 gallons
Fuel consumption per hour.	18 pounds steam.	1½ pints gasoline.	36 pounds steam.	3 pints gasoline.
Water line inside diameter.	⅛ inch	⅛ inch	⅛ inch	⅛ inch
Waste line inside diameter.	⅜ inch	⅜ inch	⅜ inch	⅜ inch
Steam line inside diameter.	⅜ inch	.....	½ inch	.....
Cooling water required.	16 gallons per hour.	16 gallons per hour.	40 gallons per hour.	40 gallons per hour.

PART TWO

OPERATING INSTRUCTIONS

Section III. GENERAL

6. Scope

Part Two contains information for the guidance of the personnel responsible for the operation of this equipment. It contains information on the operation of the equipment with the description and location of the controls and instruments.

Note. Failure or unsatisfactory performance of equipment will be reported on WD AGO Form 468.

Section IV. SERVICE UPON RECEIPT OF EQUIPMENT

7. Unpacking and Assembling, Market Forge Models

a. Open the shipping box carefully.

b. Remove the paper packing and excelsior so as to uncover the still completely.

c. Remove the still from the shipping box.

d. The still as packed for shipment is completely assembled and ready for operation as soon as all particles of excelsior and packing material have been removed and the heating and water connections have been made.

8. Unpacking and Assembling, Consolidated Machine Works Models

a. GASOLINE-HEATED MODEL. (1) Open the shipping box carefully.

(2) Remove the paper packing and excelsior so as to uncover the parts of the still.

(3) Remove the condenser assembly from the box and clean off all particles of excelsior or packing material and put the condenser in a place where it will not be damaged.

(4) Remove the remainder of the still from the packing box and clean off all packing material from it.

(5) Place the condenser on the boiler and secure it by means of the four cover locks and wing screws which hold the condenser assembly in place.

(6) Connect the tube to the fittings on the condenser. The preheated water tube drains into the water level column.

b. STEAM-HEATED MODEL. (1) Open the shipping box carefully.

(2) Remove all braces, being careful not to damage the still.

(3) Remove all packing material from the still.

(4) The still as received is completely assembled.

(5) Connect the water and steam connections.

Section V. CONTROLS AND INSTRUMENTS

9. Controls

a. The controls of the gasoline-heated models are described in TM 8–615.

b. A ⅜-inch brass bibcock is provided with each unit for the purpose of draining the boiler. It is located at the base of the boiler.

c. If there are no controls provided with the steam models for regulating the amount of steam entering the boiler, SR00507 (VALVE, steam, Jenkins No. ABTJA, ⅜ inch, complete:) may be used. For the steam return line SR00499, (TRAP, steam, ⅜ inch, 60 lbs., Webster No. 789–2, complete:) may be used.

d. A water supply valve is supplied with each 5-gallon unit.

e. A hard water petcock is provided for the purpose of draining off the surface water in the boiler of each 5-gallon unit.

f. Two shut off valves are provided on the glass gauge assembly of the 5-gallon gasoline-heated model in case the glass gauge breaks.

10. Instruments

a. A glass gauge is supplied with the 5-gallon unit. The glass gauge of the gasoline-heated model is equipped with shut off valves at the top and bottom of the gauge in case the glass breaks. The steam-heated model does not have manually controlled shut off valves on the glass gauge assembly.

Section VI. OPERATION

11. General

The distilling apparatus is designed for operation with soft, clean water, such as is used for drinking purposes. Extremely hard, salt, or dirty water should not be used. In general the operation of all the units is essentially the same. Minor variations, however, are incorporated in the following paragraphs.

12. Operation, Steam-Heated Model

a. TWO-GALLON UNIT. (1) Turn on the water supply and fill the boiler. When full, water will flow from the overflow outlet.

(2) With the water flowing into the boiler and running from the overflow, turn on the steam supply.

Caution: Make sure the steam pressure is between 40 and 60 pounds. Do not operate the apparatus at any other pressure.

(3) In a short time the water will boil. Steam will be generated and will appear at the vent at the end of the condenser. Distilled water will flow through the condenser outlet tube. (See (6) fig. 6, and (8) fig. 7.)

(4) Regulate the incoming water supply to allow a small amount of steam to escape from the vent at the end of the condenser. The ratio of cooling water discharged at the bottom of the water level column to the distilled water output should be approximately 8 to 1.

(5) To stop the production of distilled water, first turn off the steam supply and then turn off the water supply.

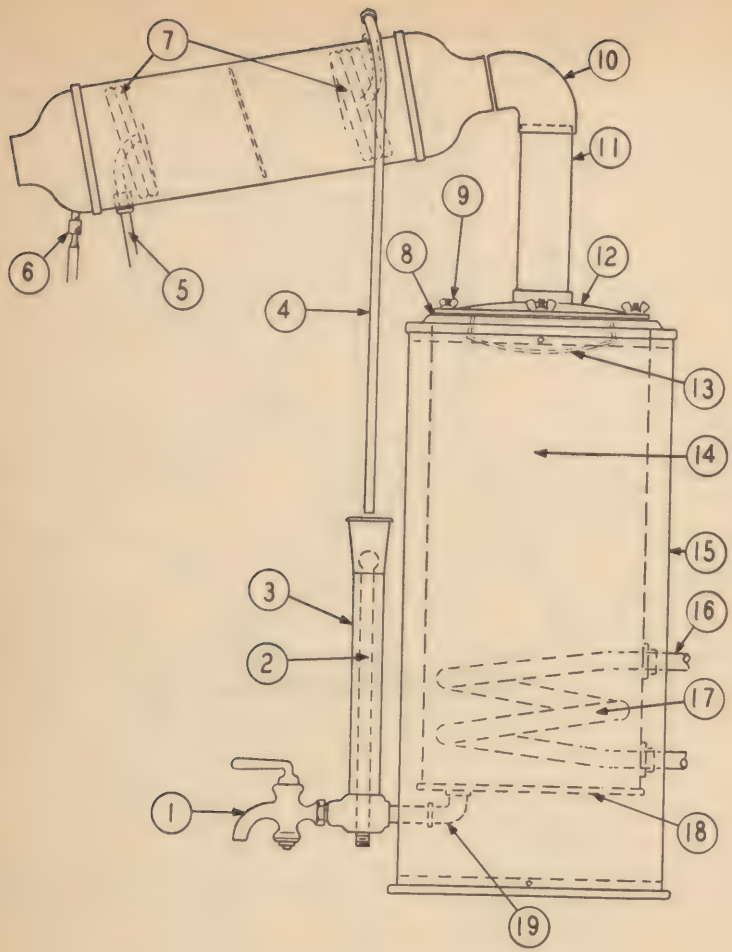
(6) When the steam and water supplies have been turned off, open the drain cock and drain all the water in the boiler. Then rinse the boiler by filling with clean, cold water and drain again.

b. FIVE-GALLON UNIT. The operation of the 5-gallon steam-heated model is essentially the same as the 2-gallon steam-heated model. However, on this unit the water level should be 1½ inches from the top of the glass gauge. The hard water petcock ((3) fig. 8) should be opened to allow a very small amount of water to drain continuously during operation.

13. Operation, Gasoline-Heated Model

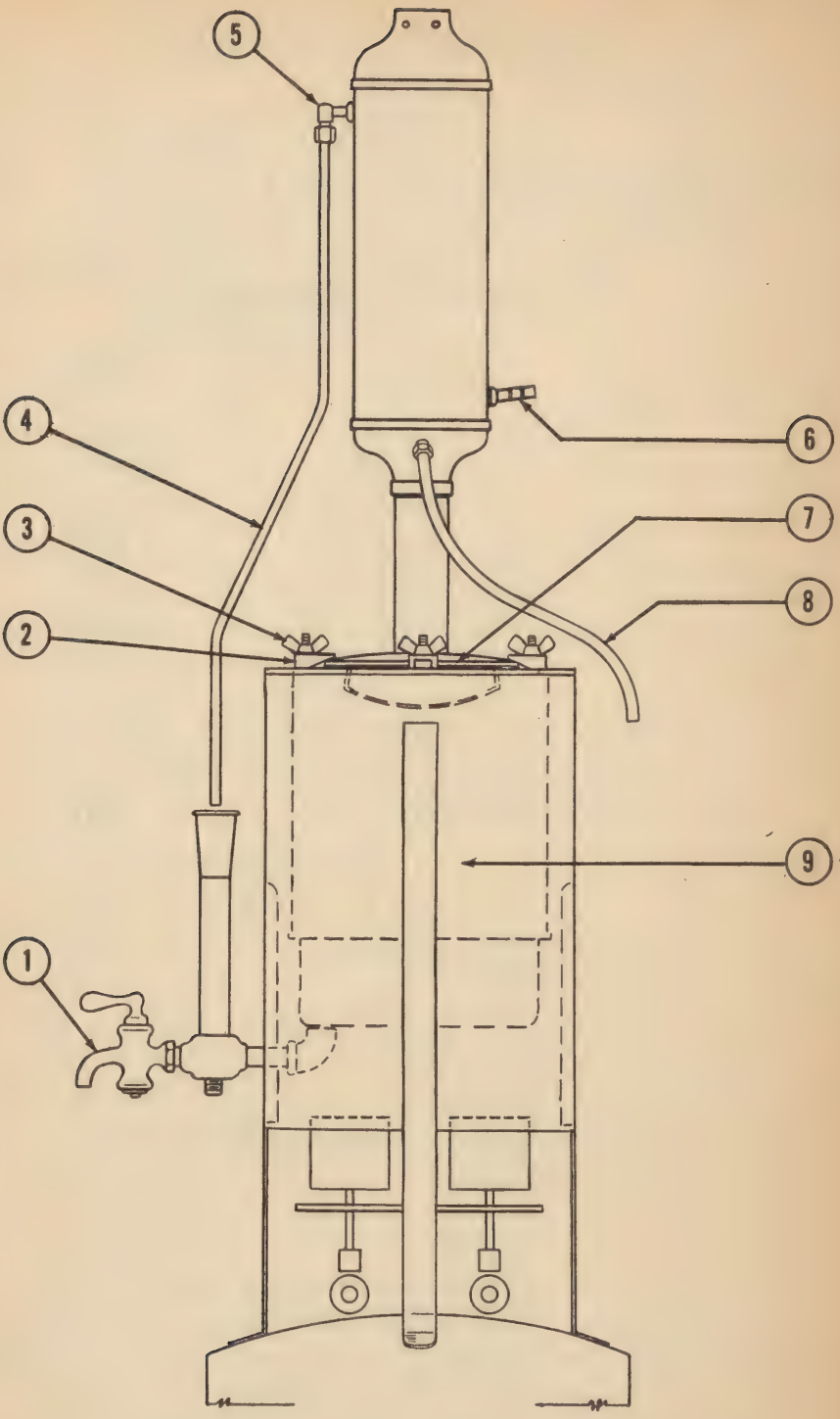
The following operating instructions apply to the gasoline-heated models manufactured by the Market Forge Co. (Aetna Water Still Co.) and the Consolidated Machine Works.

a. TWO-GALLON UNIT. (1) Turn on the water supply and fill the boiler. When full, water will flow from the overflow outlet.



1.		Boiler drain bibcock.
2.		Overflow stem.
3.		Water level column.
4.		Preheated water outlet tube.
5.		Water inlet tube.
6.		Condenser outlet tube.
7.		Cooling coil.
8.	4R03426	GASKET, evaporator top, asbestos, steam model:
9.		Wing nut.
10.		Riser elbow.
11.		Riser tube.
12.		Evaporator cover.
13.		Baffle plate.
14.		Complete evaporator for steam model.
15.		Outside jacket for steam model.
16.		Pipe connector.
17.		Steam coil.
18.		Evaporator bottom section.
19.		Water inlet elbow.

Figure 6. Details of 2-gallon steam-heated distilling apparatus; manufactured by Market Forge Co.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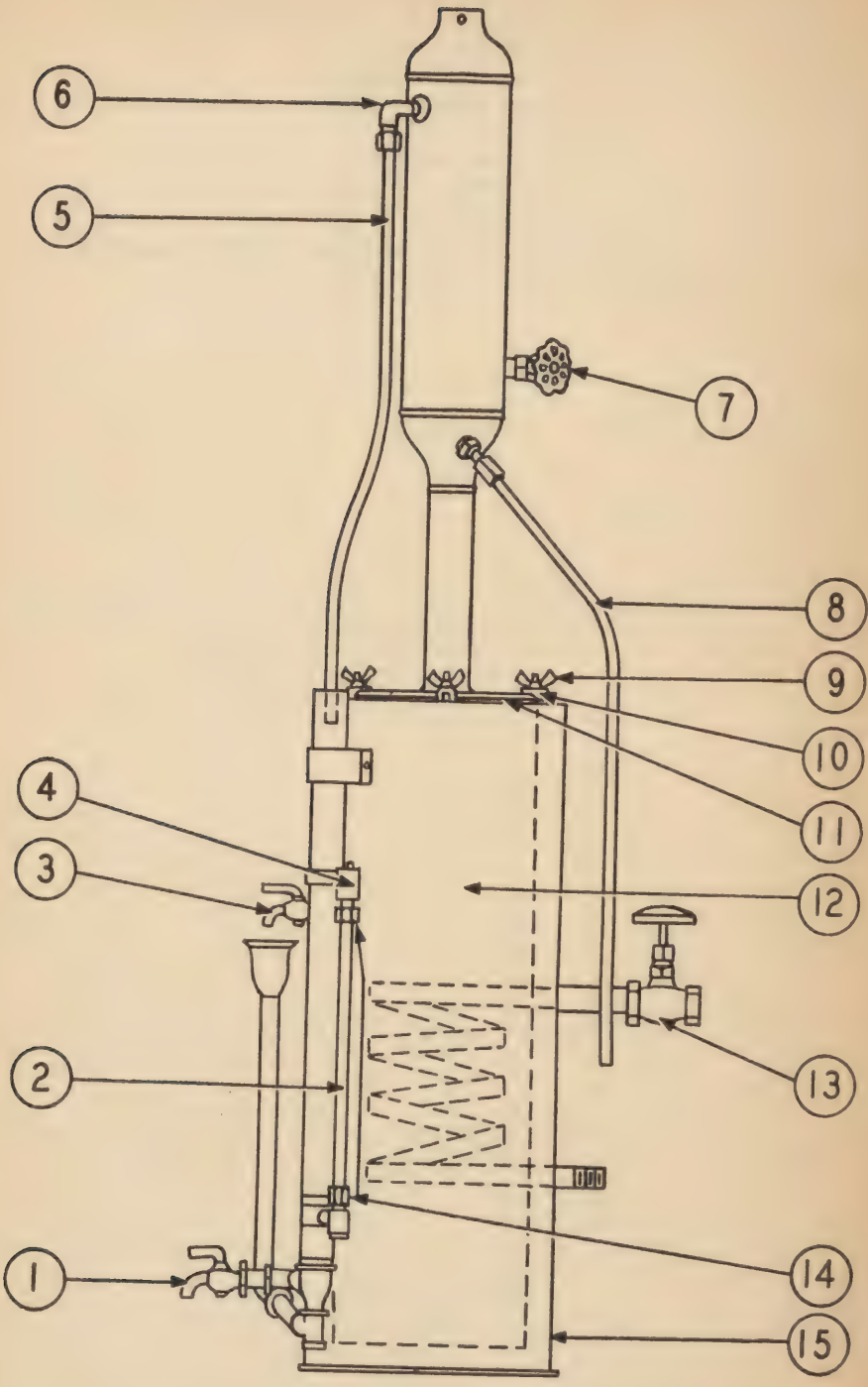
1. Bibcock for draining boiler.
2. Cover lock.
3. Wing nut.
4. Preheated water outlet tube.
5. Brass adapter.
6. Inlet water tube.
7. Asbestos gasket.
8. Condenser outlet tube.
9. Evaporator.

Figure 7. Details of 2-gallon steam-heated distilling apparatus; manufactured by Consolidated Machine Works, Inc.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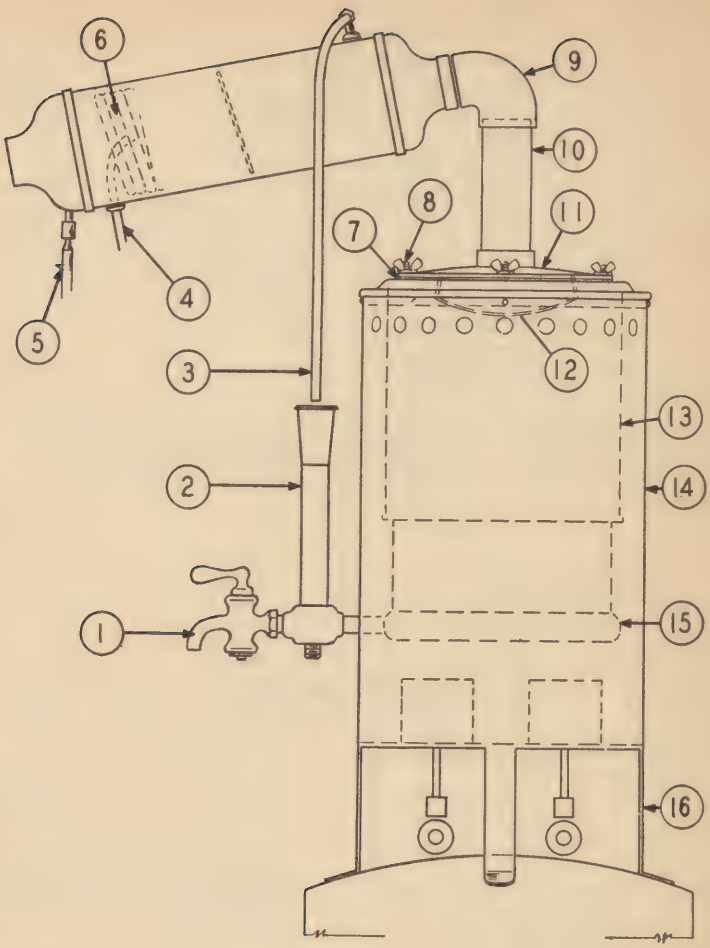
1. Boiler drain bibcock.
2. Glass gauge.
3. Hard water bibcock.
4. Glass gauge holder.
5. Preheated water outlet tube.
6. Brass adapter.
7. Water supply valve.
8. Condenser outlet tube.
9. Wing nut.
10. Cover lock.
11. Asbestos gasket for evaporator top.
12. Evaporator.
13. Steam supply valve.
14. Coupling nuts.
15. Boiler complete.

Figure 8. Details of 5-gallon steam-heated distilling apparatus; manufactured by Consolidated Machine Works, Inc.



1.		Boiler draincock.
2.		Water level column, gasoline model.
3.	4R03436	TUBE, preheated water outlet:
4.		Water inlet tube.
5.	4R03434	TUBE, condenser outlet:
6.		Cooling coil.
7.	4R03424	GASKET, evaporator top, asbestos, gasoline model:
8.	SR00050	NUT, 10 x 24, wing, brass, 100 to pkg.:
9.		Riser elbow.
10.		Riser tube.
11.		Evaporator cover.
12.		Baffle plate.
13.	4R03420	EVAPORATOR, gasoline model, complete:
14.		Outside jacket for gasoline model.
15.		Boiler bottom section.
16.		Iron support.

Figure 9. Details of 2-gallon gasoline-heated distilling apparatus; manufactured by Market Forge Co.

(2) With the water flowing into the boiler and running from the overflow, ignite the gasoline burners. See operating instructions in TM 8–615.

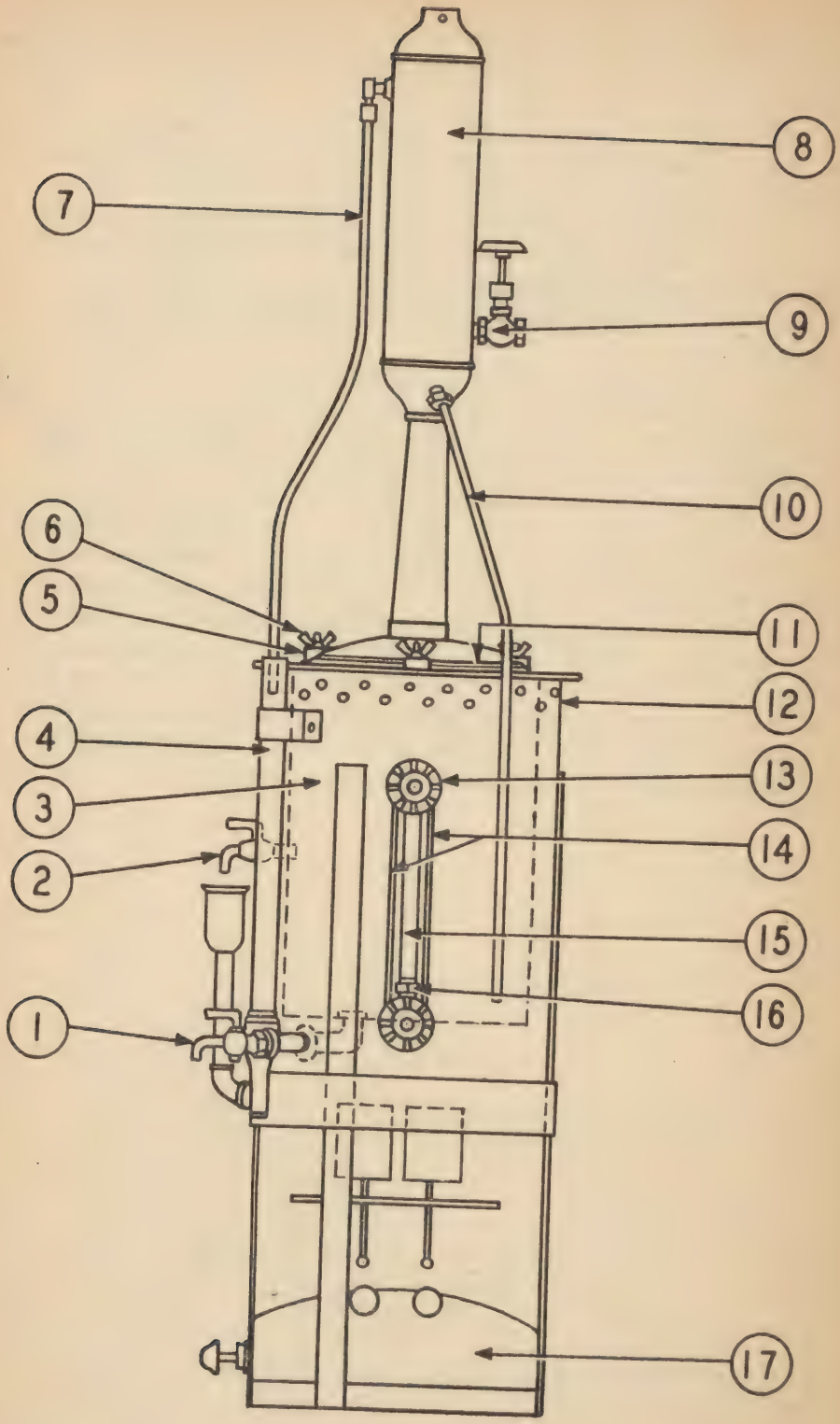
(3) In a short time the water will boil. Steam will be generated and will appear at the vent at the end of the condenser. Distilled water will flow from the condenser outlet tube. (See (5) fig. 9.)

(4) Regulate the incoming water supply to allow a small amount of steam to escape from the vent at the end of the condenser. The ratio of cooling water discharged at the bottom of the water level column to the distilled water output should be approximately 8 to 1.

(5) To stop the production of distilled water, first turn off the gasoline burners and then turn off the water supply.

(6) When the gasoline burners and the water supply have been turned off, open the drain cock and drain all water in the boiler. Then rinse boiler by filling with clean, cold water and drain again.

b. FIVE-GALLON UNIT. The operation of the 5-gallon gasoline-heated model is essentially the same as for the 2-gallon gasoline-heated model. However, on this unit the glass gauge shut off valves ((13), fig. 10) must be opened before filling the boiler with water. The water level should be 3 inches from the top of the glass gauge. (See (15) fig. 10.) The hard water petcock should be opened to allow a very small amount of water to drain continuously during operation. In the event the glass gauge breaks during operation the shut off valves on the glass gauge must be closed.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1. Boiler drain bibcock.
2. Hard water bibcock.
3. Evaporator.
4. Water level column.
5. Cover lock.
6. Wing nut.
7. Preheated water outlet tube.
8. Condenser.
9. Water supply valve.
10. Condenser outlet tube.
11. Asbestos gasket for evaporator top.
12. Boiler complete.
13. Valve stem assembly for glass gauge holder.
14. Glass gauge rods.
15. Glass gauge.
16. Coupling nuts for glass gauge.
17. Gasoline burner.

Figure 10. Details of 5-gallon gasoline-heated distilling apparatus; manufactured by Consolidated Machine Works, Inc.

PART THREE

MAINTENANCE INSTRUCTIONS

Section VII. GENERAL

14. Scope

Part Three contains information for first and second echelon maintenance. It contains information needed for service, as well as description of major units and their function in relation to other components of the equipment.

Section VIII. PREVENTIVE MAINTENANCE SERVICES

15. Operator Maintenance (First Echelon)

a. BEFORE OPERATION. The unit should be cleaned of any dirt that has collected.

b. DURING OPERATION. The hard water petcock should be opened to allow a small amount of water to drain off the top of the boiler on each 5-gallon unit.

c. AFTER OPERATION. The boiler should be rinsed and drained.

16. Organizational Maintenance (Second Echelon)

a. MONTHLY. (1) Check for proper operation of the apparatus.

(2) Check for excessive lime deposits. (See pars. 19*a* and 20*a*.)

(3) Check to see if a spare gasket ((7), fig. 9) for each gasoline-heated model is with the unit. See ASF Supply Catalog MED 7 fo rreplacement.

(4) Flush or clean the glass gauges on the 5-gallon units. (See par. 22.)

Section IX. TROUBLE SHOOTING

17. If the Apparatus Fails to Produce Distilled Water in Rated Quantities

Possible causes	*Possible remedies*
a. Lime deposits in boiler.	*a.* Clean boiler. (See par. 18.)
b. Boiler fails to heat properly.	*b.* For gasoline models. (See par. 20.) For steam models. (See par. 19.)
c. Steam leak between evaporator and boiler cover.	*c.* Replace gasket. (See par. 21.)

Section X. MAINTENANCE OPERATIONS

18. Cleaning Boiler

a. The interior of the boiler should be cleaned of lime deposits at intervals depending on the hardness of the water used. In some cases it requires cleaning every 24 hours. In all cases the boiler should be drained, rinsed with clean, cold water and drained again after each period of operation.

b. To clean the boiler proceed as follows:

(1) Loosen wing nuts and cover locks from the cover plate.

(2) Remove the condenser assembly as a unit.

(3) If the interior of the boiler is badly coated or stained, clean with PUMICE STONE, commercial, powdered, Grade No. F, one pound carton, Federal Stock No. 51–P–2700 Ord. Specification No. FXS–241, and scrub with a stiff brush. Do not use acids.

(4) After cleaning, rinse thoroughly with clean, cold water and dry with a clean cloth.

(5) Replace condenser assembly, making sure that the asbestos gasket is set properly between the boiler cover and the top of the boiler. A spare gasket ((7), fig. 9) should be kept with the gasoline-heated models at all times.

(6) Tighten cover locks and wing nuts.

19. Boiler Fails to Heat Properly, Steam Model

a. If the boiler of the steam model is slow to heat, it may be due to an excessive lime deposit on the steam coil. Clean the outside of the coils with PUMICE STONE, commercial, powdered, Grade No. F, one pound carton, Federal Stock No. 51–P–2700 Ord. Speci-

fication No. FXS–241, and scrub with a stiff brush. Do not use acids. After cleaning, rinse thoroughly with clean, cold water and dry with a clean cloth.

b. Slow heating of the boiler also may be due to low steam pressure in the steam supply line. The steam pressure should not be below 40 pounds nor above 60 pounds.

c. The distilling apparatus is a factory assembled unit and should not be dismantled in the field. There are no mechanical parts to fail. If the apparatus does not operate and a thorough cleansing will not restore its efficiency, it should be sent to a higher echelon for repair.

20. Boiler Fails to Heat Properly, Gasoline Model

a. If the boiler of the gasoline model is slow to heat, it may be due to an excessive lime deposit on the bottom of the boiler. Clean the boiler as described in paragraph 18.

b. Slow heating also may be due to improper operation of the gasoline burners. See TM 8–615 for operation and maintenance.

c. The distilling apparatus is a factory assembled unit and should not be dismantled in the field. There are no mechanical parts to fail other than those in the burners. If the apparatus does not operate and a thorough cleansing will not restore its efficiency, it should be sent to a higher echelon for repair.

21. Steam Leak Between Evaporator and Boiler Cover

If steam escapes between the evaporator and boiler cover, it may be necessary to replace the asbestos gasket found there. A spare asbestos gasket ((7), fig. 9, or (11), fig. 10) should be kept with each gasoline model at all times. Replace as follows:

a. Loosen wing nuts and cover locks holding cover in place.

b. Remove condenser assembly.

c. Remove gasket.

d. Replace with new gasket and reassemble.

Note. Certain spare parts for the Market Forge apparatus were purchased from Consolidated Machine Works to specifications for the Market Forge models and will fit this unit. If spare parts are received for use on the Market Forge (Aetna Water Still Co.) models and they do not have the appearance of the part being replaced, be certain to check to see that they do not fit before returning.

22. Cleaning and Replacing Glass Gauge, 5-Gallon Units

The glass gauge on the 5-gallon distilling apparatus should be flushed at least once a month to remove any accumulation of lime deposits within the glass gauge. If this does not remove the deposits, the glass gauge may be removed and cleaned as follows:

a. GASOLINE MODEL. (1) Remove the glass gauge rods. (See (14), fig. 10.)

(2) Remove the upper valve stem assembly ((13), fig. 10) from the holder.

(3) Loosen the glass gauge coupling nuts ((16), fig. 10) until free from the holders.

(4) Remove the glass gauge ((15), fig. 10) by pushing the glass up into the upper glass gauge holder until the bottom of the gauge is free from the lower holder and then pull the gauge downward and out of the holder.

Caution: Do not lose the gaskets and washers on the glass gauge.

(5) Clean the gauge by drawing a moist cloth through the glass gauge.

(6) Reassemble the gauge by reversing the above procedure. If the glass has been broken, be certain to remove all particles of glass before replacing and reassembling.

b. STEAM MODEL. (1) Loosen the glass gauge coupling nuts ((14), fig. 8) until free of the holders.

(2) Remove the glass gauge ((2), fig. 8) by pushing the glass up into the upper glass gauge holder until the bottom of the gauge is free from the lower holder and then pull the gauge downward and out of the holder.

(3) Clean the gauge by drawing a moist cloth through the glass gauge.

(4) Reassemble the gauge by reversing the above procedure. If the glass has been broken, be certain to remove all particles of glass before replacing and reassembling.

APPENDIX

SHIPMENT AND STORAGE (DISASSEMBLING AND PACKING)

1. Be certain the steam supply is shut off or in the case of the gasoline-heated models, that the gasoline burner is extinguished.
2. Disconnect the water connections.
3. Disconnect the steam lines of the steam-heated model.
4. Clean and dry the still thoroughly.
5. Pack the unit completely assembled in a stout box or crate using paper, rags or similar materials to keep the still from moving in its container during transit.

Caution: If the gasoline-heated model is to be stored or shipped, the gasoline must be drained from the burner tank. (See TM 8–615.)

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